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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/808,270	03/14/2001	Matthew J. Dejneka	SP01-041	3376

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CORNING INCORPORATED
SP-TI-3-1
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EXAMINER
CALEY, MICHAEL H

ART UNIT	PAPER NUMBER
2871	

DATE MAILED: 06/17/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/808,270	DEJNEKA ET AL.	
	Examiner	Art Unit	
	Michael H. Caley	2882	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on _____ .

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) 1-28 is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) 1-28 is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on 14 March 2001 is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

DETAILED ACTION

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 1-4, 6, 7, 10-17, and 19-28 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ball et al. (U.S. Patent No. 6,031,849 "Ball") in view of Ohishi et al. (U.S. Patent No. 5,309,452 "Ohishi").

Regarding claim 1, Ball discloses an optically active fiber for making a fiber laser or an amplifier comprising:

a core, doped with an optically excitable ion having a three-level transition, the core having a core refractive index and a core cross-sectional area (Column 5 lines 39-42);

an inner cladding, surrounding the core, the inner cladding having an aspect ratio greater than 1.5:1 (Column 5 lines 34-44); and

an outer cladding surrounding the inner cladding, the outer cladding having an outer cladding refractive index less than the inner cladding refractive index (Column 6 lines 39-40).

Ball discloses an example of such a fiber having a cladding cross-sectional area approximately 31 times greater than the core cross-sectional area. Ball fails to disclose the inner cladding as having an inner cladding cross-sectional area between 2 and 25 times greater than that of the core cross-sectional area as proposed. Ball, however, teaches an optimal V-value between 2.0 to 2.2, which depends upon the numerical aperture of the fiber and the operating

wavelength in addition to the core diameter. Furthermore, Ohishi teaches a more extended range for the acceptable V-value for a single mode fiber (Column 3 lines 47-53).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to have provided a larger core cross-sectional area and thus a smaller ratio between the core area and first cladding area as proposed. In order to provide an amplifier for wavelengths above 1500 nm, it would have been advantageous to increase the diameter of the core in order to maintain the taught V-value for the fiber. Additionally, for the use of a single mode fiber as taught by Ohishi, the acceptable range for the V-value of the fiber is increased, thus increasing the necessary diameter of the core to attain the taught V-value. One would have been motivated to increase the size of the core to allow the amplifier to operate at higher wavelengths without experiencing single mode cutoff by maintaining the V-value within the prescribed range.

Regarding claim 2, Ball discloses the core as sized sufficiently small such that the core supports only one transverse mode at the output signal wavelength, and the only one transverse mode has a mode field diameter equal to that of a standard single mode fiber for optimum coupling (Column 5 lines 58-63).

Regarding claim 3, Ball discloses the core as doped with the optically excitable Yb ion having the three-level transition at about 980nm. Ball fails to disclose the inner cladding as having a cross-sectional area between 2 and 8 times greater than that of the core cross-sectional area. Ball, however, teaches an optimal V-value between 2.0 to 2.2, which depends upon the numerical aperture of the fiber and the operating wavelength in addition to the core diameter.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to have provided an inner cladding cross-sectional area between 2 and 8 times greater

than that of the core cross-sectional area. As stated above, it would have been advantageous to maintain such a ratio when operating at wavelengths higher than 1500nm.

Regarding claim 4, Ball discloses an inner cladding cross-sectional area as less than the value proposed such that sufficient inversion exists that the optical amplifier may operate at the three-level transition (Column 3 line 58-Column 5 line 44).

Regarding claims 6 and 7, it would have been inherent that the numerical aperture in a fiber amplifier as modified exist within the proposed constraints. Otherwise, the V-value would fall out of the range taught by Ball and Ohishi, rendering an inoperative amplifier.

Regarding claims 10, 11, 19, 20, 23, and 26, Ball fails to disclose the specific pumping and signal coupling means for the optically active fiber as proposed. The Examiner takes Official notice that such pumping means are old and well known in the art of optical amplification.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to have pumped the optical fiber amplifier using one of the proposed methods. One would have been motivated to pump the fiber using one of the proposed methods in order to accommodate for the type of amplifying or lasing application. The choice of pumping method would have been an engineering expediency to accommodate for a particular desired length of amplifying fiber or type of connection made to the fiber.

Regarding claim 12, Ball fails to disclose the core as having a graded index. Ball, however, teaches the inner core and the inner cladding as functioning as a multimode pump (Column 5 lines 20-33).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to have provided a graded index core for the fiber. Such a core would have been effective to facilitate coupling between the modes to increase the efficiency of the amplifier.

Regarding claims 13, 24, and 25, Ball fails to disclose the outer cladding as doped with a signal absorbing dopant to prevent amplification of the inner cladding modes. Ball, however, teaches a device in which amplification solely occurs in the inner cladding modes. The Examiner takes Official notice that such signal absorbing dopants are old and well known in the art as a means of disallowing unwanted amplification in such a fiber with multiple cladding layers.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to have included dopants in the outer core of the fiber. Such an addition would have prohibited undesired amplification of the signal as is well known in the art. Additionally, it would have been obvious to have provided such a dopant such as to not overlap with the amplification region. In such a configuration, it would have been inherent that the higher-order modes of the inner cladding experience a lower overlap with the doped area than the fundamental mode.

Regarding claim 14, Ball discloses the optically excitable ion as Er producing a three-level amplification for making a C-band Er amplifier and the inner cladding cross-sectional area as less than 780 microns squared (Column 8 lines 21-31).

Regarding claims 15-17, Ball discloses the proposed cross-sectional limitations (Figure 3).

Regarding claim 21, Ball discloses the composition as proposed (Column 5 lines 34-44).

Regarding claim 22, Ball discloses Yb as the excitable ion for pumping the Er-doped fiber amplifier (Column 3 lines 49-50).

Regarding claims 27 and 28, Ball discloses a fiber laser comprising:

broad-area laser diode having a pump light having an output power of at least 1 Watt (Column 8 lines 4-6).

Claims 5, 8, and 9 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ball in view of Ohishi and in further view of Sanghera et al. (U.S. Patent No. 5,973,824 "Sanghera").

Ball discloses all of the claimed limitations except for the core and the inner cladding as made from different compositions of antimony-silicate glass. Sanghera, however, teaches the use of antimony as one of many elements which may be used in amplifying optical fiber to adjust the optical, thermal, and mechanical properties of the fiber (Column 4 lines 44-59).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to have used antimony as taught by Sanghera to modify physical characteristics of the fiber disclosed by Ball. Ball discloses preferred characteristics of an amplifying optical fiber given by the cross sectional area and refractive indices of the parts of the fiber. One would have been motivated to tailor such a fiber for a particular application given a needed resistance to changes in heat or mechanical strength or refractive index changing dopant. Using such a composition of antimony-silicate glass is old and well known in the art as a means of changing such characteristics of an optical fiber. Additionally, the core and the inner cladding would inherently require different compositions of such glass to provide a change in refractive index.

Regarding claims 8 and 9, Ball fails to disclose the coefficient of thermal expansion mismatches between the core and cladding portions of the fiber. Sanghera, however, teaches a variety of elements to modify the composition of the fiber to tailor its thermal properties (Column 4 lines 44-59).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to have added such modifying elements to minimize the CTE mismatches between the various portions of the fiber. Such an enhancement would have been motivated by a desire to maintain constant optical properties of the fiber over a range of temperatures.

Claim 18 is rejected under 35 U.S.C. 103(a) as being unpatentable over Ball in view of Ohishi and in further view of DiGiovanni (U.S. Patent No. 5,949,941).

Ball discloses all of the proposed limitations except for the inner cladding as having a generally "Saturn" –like shape. DiGiovanni, however, teaches such an amplifier as having the proposed shape (Figure 3D).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to have constructed the fiber as proposed by DiGiovanni. Such a construction would have reduced costs and simplified the manufacturing process for reasons as proposed by DiGiovanni (Column 5 lines 6-18). One would have been motivated to have constructed the fiber in such a manner, rendering a "Saturn" –like shape in order to reduce costs in constructing the fiber.

Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

U.S. Patent No. 5,485,480 to Kleinerman as an alternative fiber optic laser and amplifier with an elliptical inner cladding region.

U.S. Patent No. 5,530,710 to Grubb as an alternative three-level optical laser and amplifier with an elongated inner cladding region.

U.S. Patent No. 4,815,079 to Snitzer et al. as an alternative fiber optic laser and amplifier with an elongated inner cladding region.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Michael H. Caley whose telephone number is (703) 305-7913. The examiner can normally be reached on M-F 8:30 a.m. - 5:00 p.m..

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Robert Kim can be reached on (703) 305-3492. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 308-7722 for regular communications and (703) 308-7724 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0956.

mhc
June 3, 2003

DAVID V. BRUCE
PRIMARY EXAMINER